وزارة التعليم
Ministry of Education

AL NOOR INTERNATIONAL SCHOOL
Riyadh, Saudi Arabia

Life Science Workbook

Name: _____

Grade 8 - _____

Academic Year: _____

Name_____Date_____Class _____

PART 1 Lesson 1: How Scientists Work

If the statement is true, write *true.* If the statement is false, change the underlined wordor words to make the statement true.

1. _____ Classifying involves evaluating observations and data to reach a conclusion about them.
2. _____ Tools, such as the microscope, can help scientists when they are observing.
3. _____ Scientists make predictions to help them study things that cannot be observed directed.
4. _____ A(n) qualitative observation involves descriptions that cannot be expressed innumbers.
5. _____ Inferring is a way to learn about the natural world.

Fill in the blank to complete each statement.

6. Scientists use past experience or evidence to make _____about what will happen in the future.
7. To draw a conclusion, scientists must_____data from an investigation.
8. _____are attempts to explain what has already happened.
9. _____is one-way scientists organize data from an experiment.
10. A scientific_____is the forming and testing of ideas about the natural world.

Name_____Date_____Class _____

Lesson 1: How Scientists Work

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Name six skills scientists use to help them form and answer questions about the natural world.
2. What is the difference between quantitative and qualitative observations?
3. How does making models help scientists observe?
4. What is the difference between inferring and predicting?

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

5. ____predicting	**a.** an observation dealing with numbers or amounts
6. ____observing	**b.** explaining or interpreting observations
7. ____qualitative observation	**c.** grouping together items that are alike in some way
8. ____inferring	**d.** evaluating observations and data to reach conclusions
9. ____science	**e.** using one or more senses to gather information
10. ____analyzing	**f.** an observation that deals with descriptions that cannotbe expressed in numbers
11. ____quantitative observation	**g.** making a statement or claim about what will happen in the future
12. ____classifying	**h.** a way of learning about the natural world

Name_____Date_____Class _____

Enrich

Lesson 1: How Scientists Work

Today, clean drinking water flows from faucets across the United States, but the discovery of water disinfection took hundreds of years and involved the work of many scientists. Read the passage below and then use a separate sheet of paper to answer the questions that follow.

Water Treatment and Disinfection

Before cities began treating water, thousands of people died every year from waterborne diseasessuch as cholera, typhoid fever, and dysentery. Today, American cities add small amounts of chlorine to relatively huge volumes of water in order to destroy the bacteria and viruses that cause disease. Chlorination also helps prevent recontamination as water flows from the treatment plant, through pipes,and into homes.

Anton van Leeuwenhoek was a Dutchman who learned to grind lenses and make microscopes. Using hisinvention, he was able to see microorganisms in water in 1676. As a result, cities began to experiment with water filtration. Filters were made from a variety of substances, including sand, wool, sponge, andcharcoal.

In 1774, Swedish pharmacist Carl Wilhelm Scheele discovered chlorine when he put a few drops of hydrochloric acid on a sheet of manganese dioxide and a greenish-yellow gas arose. Later chemists wereable to group chlorine as one of 100 naturally occurring elements. Other scientists studied models of chlorine's molecular structure. They concluded that chlorine's disinfectant quality comes from its ability to bond with and destroy the outer surfaces of bacteria and viruses.

In 1854, British scientist John Snow realized that cholera spread through contaminated water. He wasable to trace outbreaks of cholera to specific water pumps. He was the first to predict the use of chlorine to disinfect water.

1. How did scientific observation play a role in the discovery of water chlorination?

2. What scientific skill was used when scientists grouped chlorine withthe other natural elements?

3. How did making models contribute to the understanding of chlorineas a disinfectant?

4. What prediction of John Snow's proved correct?

5. How does the history of water chlorination suggest the advantagesof scientists working together?

Name_____Date_____Class _____

Lesson 2: The Characteristics of ScientificKnowledge

Understanding Main Ideas

Answer the following questions in the spaces provided.

1. How do scientists analyze empirical evidence?

_____

_____

_____

2. Give one example of a pseudoscientific idea and one example of a scientific idea.

_____

_____

_____

3. How might the conclusions drawn from scientific investigations change?

_____

_____

_____

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

4. ___empirical evidence	**a.** facts, figures, and other evidence
5. ___objective reasoning	**b.** based on evidence
6. ___skepticism	**c.** based on personal feelings or values
7. ___pseudoscience	**d.** an attitude of doubt
8. ___subjective reasoning	**e.** data and observations collected through a scientific process
9. ___data	**f.** set of subjective belief

Name_____Date_____Class _____

Lesson 2: The Characteristics ofScientific Knowledge

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

1. _____Scientific reasoning is characterized by subjective reasoning.
2. _____Reasoning based on personal feelings is objective reasoning.
3. _____A pseudoscience is not a way of knowing but a set of beliefs.
4. _____Understanding the world requires both scientific and pseudoscientific ways ofknowing.
5. _____Science and its methods are characterized by a(n) chaotic approach to learningabout the world.

Fill in the blank to complete each statement.

6. All scientific investigations involve collecting relevant _____ to support researchers'conclusions.
7. Having an attitude of_____can lead to new understandings.
8. _____are facts, figures, and evidence collected during a scientific investigation.
9. _____is a skill that scientists use in scientific investigations.
10. Pseudoscience is based on_____.

Name_____ Date_____ Class _____

Enrich

Lesson 2: The Characteristics of ScientificKnowledge

Read the passage. Then use a separate sheet of paper to answer the questions that follow.

Max Born

Born into a Jewish family in 1882 in Breslau, Poland, Max born was a gifted physicist and mathematician. He studied at the University of Breslau, Heidelberg University in Germany, and the University of Zurich in Switzerland. Born was instrumental in the development of quantum mechanics, a field of physics thatattempts to discover and describe the behavior of energy and matter in atoms as well as in subatomic particles. From 1909 until 1933, born held professorships at several German universities. In addition to mathematics and quantum mechanics, he did extensive work in the fields of matrices, crystals, andoptics.

Born served in the German Army in World War I. Nevertheless, after the Nazis came to power inGermany, Born was stripped of his professorship because of his Jewish heritage. He was forced to emigrate from Germany in 1933. After settling in the United Kingdom, Born lectured at Cambridge University before becoming a professor at the University of Edinburgh. In 1954, he was awarded the Nobel Prize in Physics. The quotation below is from Born's acceptance speech at the Nobel Banquet in Stockholm, Sweden.

The human mind is conservative, and the scientist makes no exception from this rule. He will accept anew theory only if it stands the trial of many experimental tests.

1. According to Born, how are scientists ordinary?

2. Does Born perceive people as eager or reluctant to embrace change? Support your answer with evidence fromthe quotation.

3. Does Born believe that new scientific theories can ever gain acceptance and, if so, how?

4. What might happen if scientists accepted new theories as soon as new theories were proposed?

Name_____Date_____Class _____

Lesson 3: Designing an Experiment

If the statement is true, write *true.* If the statement is false, change the underlined wordor words to make the statement true.

1. _____To test a hypothesis, a scientist purposely changes the dependent variable.
2. _____When drawing a conclusion, scientists examine the data to see if it supports or failsto support the hypothesis.
3. _____The factor that may change in a controlled experiment is the dependent variable.
4. _____A helpful tool for keeping data organized during an experiment is a graph.
5. _____A hypothesis can be accepted as true after two repeated trials have been performed.

Fill in the blank to complete each statement.

6. Posing a question is the first step in the _____process.
7. Accidentally having two or more variables that change in an experiment is one way to introduce _____ to the experiment.
8. When scientists communicate results, they always include a description of procedure so that other scientistscan perform a_____to evaluate the accuracy of the results.
9. Scientists design-controlled experiments to test a_____.
10. A_____is a generalization that uses logical reasoning to make senseof observations.

Name_____Date_____Class _____

Lesson 3: Designing an Experiment

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. What is the function of a hypothesis in the scientific inquiry process?
2. What role do independent and dependent variables play in a controlled experiment?
3. Why are repeated trials required before accepting a hypothesis as true?
4. How do scientists develop scientific explanations about subjects that are impossible to study throughcontrolled experiments?

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

5. ___controlled experiment	**a.** a repetition of an experiment
6. ___hypothesis	**b.** a generalization that makes sense of observations byusing logical reasoning
7. ___repeated trial	**c.** an error in the design of the experiment
8. ___dependent variable	**d.** the factor that is purposely changed to test a hypothesis
9. ___scientific explanation	**e.** the process by which people gather evidence about the natural world and propose explanations based on this evidence
10. ___bias	**f.** an attempt by a different group of scientists to conductthe same experiment
11. ___scientific inquiry	**g.** the factor that may change in response to the independent variable
12. ___independent variable	**h.** a possible answer to a scientific question
13. ___replication	**i.** a scientific experiment in which only one variable is changed at atime

Name_____ Date_____ Class _____

Enrich

Lesson 3: Designing an Experiment

Density is the measure of how much mass is contained in a given volume. A common SI unit for density is g/cm^3, where the mass is measured in grams and the volume is measured in cm^3. As a physical property of matter, each substance has its own unique density. Read the passage below and then use a separate sheet of paper to answer the questions that follow.

The Effect of Density on Heat Retention in Liquids

For an exercise in scientific inquiry, Clark posed a question about density. He wondered if the density of liquid affected the liquid's ability to retain heat. Before determining a hypothesis, Clark researched density. He learned that the denser a liquid is the more molecules it contains. He knew that molecules absorb heat. So, he reasoned that denser liquids would absorb more heat. The molecules in the denser liquids would move faster, resulting in even more heat. His possible answer to his scientific question wasthat denser liquids would retain heat longer than less dense liquids.

Clark designed an experiment to test this hypothesis. He chose three liquids of different densities—water(1 g/cm^3), orange juice (1.25 g/cm^3), and maple syrup (1.32 g/cm^3). He had three test tubes, and he put water in one, orange juice in another, and maple syrup in the third. He used equal amounts of each liquid. He placed the test tube containing water in boiling water for two minutes, the test tube containing orange juice in boiling water for three minutes, and the test tube containing syrup in boilingwater for four minutes. After removing the test tubes from the boiling water, he used a thermometer tomeasure their temperatures every minute for five minutes.

Clark ran three trials. Then he took averages of all the temperatures as the liquids cooled. After organizing and interpreting his data, Clark determined that his hypothesis was incorrect. The densest liquid, syrup, cooled down the quickest. Orange juice retained heat the longest. Clark then reasoned thatthe molecular makeup of the liquid itself, rather than its density, determined its ability to retain heat.

1. What was Clark's hypothesis?

2. How did Clark introduce bias into the experiment?

3. What did Clark conclude from his results?

4. What were Clark's independent and dependent variables?

Name_____Date_____Class _____

Lesson 4: Scientific Literacy

Understanding Main Ideas

Answer the following questions in the spaces provided.

1. What is the benefit of having scientific literacy?

_____

_____

_____

2. How might you go about analyzing a scientific claim?

_____

_____

3. What would you need to make a decision or design an experiment about a certain scientific topic?

_____

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

4. ___evidence

5. ___scientific literacy

6. ___opinion

a. includes observations and conclusions that have beenrepeated

b. understanding scientific terms and principles well enough to ask questions, evaluate information, and make decisions

c. an idea that may be formed from evidence but has not been confirmedby evidence

Name_____Date_____Class _____

Lesson 4: Scientific Literacy

Write the letter of the correct answer on the line at the left.

1. ___What does having scientific literacy mean being able to do?

A ask scientific questions

B evaluate scientific information

C understanding scientific terms

D all of the above

2._____By looking for research bias and errors you can do which of the following?

A analyze scientific claims

B ask scientific questions

C design an experiment

D conduct an experiment

3. Which is NOT a source of reliable background information?

A a biased organization

B a government agency

C a magazine

D a museum

4. ___To evaluate scientific information, you must first distinguish between which of the following?

A fact and fiction

B evidence and opinion

C questions and answers

D research and experiments

If the statement is true, write *true.* If the statement is false, change the underlined wordor words to make the statement true.

5. _____Evidence includes observations and conclusions that have been repeated.

6. _____Relevant information is knowledge that relates to the question being asked.

7. _____You need background information that is both relevant and reliable to makedecisions and design experiments.

8. _____Reliable information comes from a person or organization that is biased.

9. _____You can use scientific reasoning to analyze scientific claims by identifyingfaulty reasoning.

10. _____An opinion is an idea that may be formed from evidence but has beenconfirmed by evidence.

Name_____Date_____Class _____

Enrich

Lesson 4: Scientific Literacy

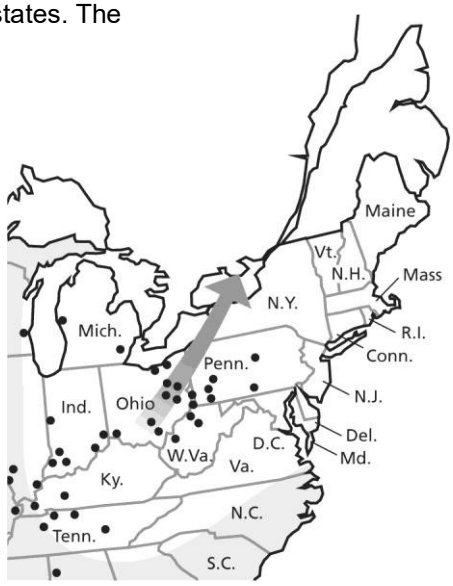
Read the passage and study the map below. Then use a separate sheet of paper to answer the questions that follow.

Acid Rain—A Public Issue

One important issue that requires the public to have scientific literacy is related to problems causedby acid precipitation—also called acid rain. Acid rain is rain and other kinds of precipitation that have become polluted by acids. Understanding the causes and effects of acid rain requires a basic knowledge of scientific principles.

The main cause of acid rain is the burning of coal to produce electricity at power plants. The burning ofcoal can produce a chemical called sulfur dioxide, which is released into the air by power plants through
their smokestacks. High in the atmosphere, the sulfur dioxide combines with water to form sulfuric acid,a harmful chemical. The sulfuric acid falls to Earth as rain, snow, and other kinds of precipitation. This acid rain pollutes lakes, rivers, and other bodies of water. Water polluted with acid precipitation can destroy plants, animals, and microscopic life forms. In fact, almost nothing can live in some lakes whereacid rain has long been a problem.

One great difficulty in addressing this problem of acid rain is that the area harmed by the pollution isgenerally not the area where the pollution is released into the air. The dots on the map on this page represent large smokestacks that release sulfur dioxide into the air. Notice that most of these are located
in midwestern states. Normal winds in the united states—the arrow on the map—blow air from themidwest to the northeast toward the new england states. The acid rain then falls in upstate New york and New England. The result of these winds is that there is a difference between wherethe pollution is produced and where the pollution does harm. only if people in both areas understand science can solutions tothe problem of acid rain can be found.



1. What is acid rain and what causes it?

2. To understand the causes and effects of acid rain, what does a citizen have to understand about science?

3. According to the map, what area of the country is mainly responsible for the production of acid rain, andwhat area mainly feels the effects?

4. Why is it especially important for people in midwestern states to have a good understanding ofscience if the problem of acid rain is to be solved?

Name_____Date_____Class _____

Chapter 1: Lesson 1: Darwin's Theory

Write the letter of the correct answer on the line at the left.

1. ____Members of a species can mate with each other and produce
A gene pools
B fertile offspring
C variations
D adaptations

2. ____The different shapes of bird beaks are examples of
A fossils
B adaptation
C evolution
D naturalism

3.____Only the organisms with a desired characteristic are bred in
A artificial selection
B natural selection
C England
D South America

4. ____The preserved remains of an organism that lived long ago is a(n)
A adaptation
B Galápagos
C fossil
D *Beagle*

If the statement is true, write *true.* If the statement is false, change the underlined word orwords to make the statement true.

5. _____Today scientists know that organisms are much <u>less</u> diverse than Darwinimagined.

6. _____In Darwin's book *<u>The Population of Species</u>,* he proposed that evolutionoccurs by means of natural selection.

7. _____Without <u>variation</u>, all the members of a species would have the sametraits.

8. _____To understand how evolution might occur, Darwin studied the offspring of <u>wild</u> animals that were produced by artificial selection.

9. _____In 1858, <u>Alfred Russel Wallace and Charles Darwin</u> proposed anexplanation for how evolution occurs.

10. _____Darwin made a number of important observations on the <u>Hawaiian</u>Islands.

Name_____Date_____Class _____

Lesson 1: Darwin's Theory

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Who was Charles Darwin, and what did he do on the *Beagle's* five-year voyage around the world?

2. What is evolution?

3. When members of a species compete, what do they compete for?

4. What happens when species overproduce offspring?

5. How do helpful variations accumulate in a species over time?

Building Vocabulary

Fill in the blank to complete each statement.

6. A(n)_____is a group of similar organisms that can mate with each other andproduce fertile offspring.

7. A(n)_____is a trait that helps an organism survive and reproduce.

8. A scientific_____is a well-tested concept that explains a wide range of observations.

9. The process by which individuals that are better adapted to their environment are more likely to survive and reproduce is called_____.

10. That some newly hatched turtles can swim faster than others of the same species is evidence of _____within a species.

Name_____Date_____Class _____

Enrich

Lesson 1: Darwin's Theory

If you had been a biologist in the 1800s, you would have had to decide between two main theories about how evolution occurred. Consider the long neck of a giraffe. How did that evolve? Read the two explanations below. Then use a separate sheet of paper to answer the questions that follow.

Two Theories of Evolution

Theory 1

The ancestors of giraffes had short necks, and there was great competition for the plant food near the ground. Some of the giraffes kept trying to stretch their necks to reach leaves higher in the trees.

As they stretched and stretched their necks became longer. As their necks became longer, they were able to reach more food. Those ancestral giraffes survived to reproduce, while the giraffes that had notstretched their necks died. The offspring of giraffes with stretched necks inherited the longer necks.

This process continued for generation after generation. In this way, giraffes evolved with longer andlonger necks.

Theory 2

The ancestors of giraffes had short necks, and there was great competition for the plant food near the ground. Some of the ancestral giraffes naturally had slightly longer necks than others.

The individuals with longer necks could reach leaves higher in trees, and therefore could eat morefood. Because those ancestral giraffes ate more food, they survived to produce offspring, while the individuals with shorter necks did not. The offspring of giraffes with longer necks inherited the longer necks. This process continued for generation after generation. In this way, giraffesevolved with longer and longer necks.

1. In Theory 1, what caused the giraffe neck to become longer?

2. In Theory 2, what caused the giraffe neck to become longer?

3. According to what scientists now know about genes, could thegiraffes' offspring have inherited longer necks, as described inTheory 1? As described in Theory 2? Explain.

4. Which of the two theories matches Darwin's theory of evolution?Explain.

Name_____Date_____Class _____

Lesson 2: Evidence of Evolution

Write the letter of the correct answer on the line at the left.

1. ____The millions of fossils that scientists have collected are called the fossil

A architecture
B record
C data base
D library

2. ____Scientists infer evolutionary relationships by comparing the early development of different

A dinosaurs
B backbones
C proteins
D organisms

3. ____Scientists infer that species with similar body structures and development patterns had a common

A environment
B predator
C ancestor
D gene

4. ____Scientists have found a great deal of evidence that supports Darwin's theory of

A atomic structure
B creation
C evolution
D relativity

Fill in the blank to complete each statement.

5. Similar structures that related species have inherited from a common ancestor are called_____structures.

6. Scientists compare the_____bases in the DNA of different species to infer howclosely related the species are.

7. In most cases, evidence from DNA and_____has confirmedconclusions about evolutionary relationships based on fossils, embryos, and body structure.

8. An organism's_____is its basic body plan.

9. Fishes, amphibians, reptiles, birds, and mammals all have an internal skeleton with a _____.

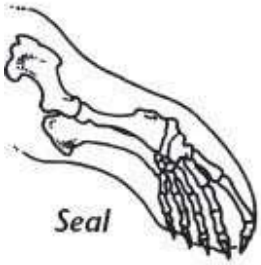
10. Scientist can compare the order of_____ina protein to seehow closely related two species are.

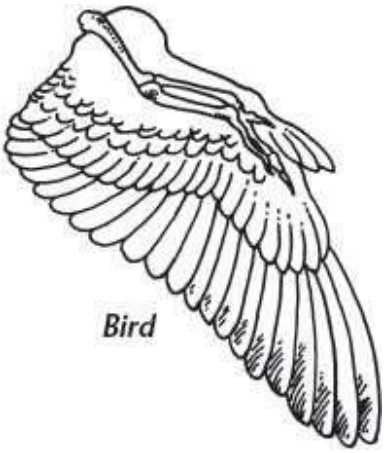
Name_____Date_____Class _____

Lesson 2: Evidence of Evolution

Understanding Main Ideas

Use the figures below to answer Questions 1–3.





1. Compare and contrast the bones of a bird's wing and a seal's flipper. _____

_____

_____

2. What can scientists infer from the similarities between these two structures? _____

_____

_____

3. Describe how DNA evidence might be used to confirm scientists' conclusions about any relationship between birds and seals. _____

_____

Building Vocabulary

Write a definition for the term on the lines below.

4. homologous structures

_____

Name_____Date_____Class _____

Enrich

Lesson 2: Evidence of Evolution

Scientists use fossils to better understand how organisms evolve. But how do scientists determine the age of a particular fossil? Read the passage below. Then use a separate sheet of paper to answer the questions that follow.

Dating the Fossil Record

Paleontologists, or scientists who study fossils, use two basic methods to identify the age of fossils:relative dating and radiometric dating.

Relative dating determines the age of a fossil by looking at its relative position in the layers of rock in theground. This method is also known as *stratigraphic dating.* Stratigraphic refers to the order and relative
position of the layers of rock. For example, a fossil is found in a certain layer of rock, so the layers belowthe fossil are older and layers above the fossil are younger. Index fossils are an important tool used in relative dating. These are commonly found fossils that have a known range in the geologic record. For instance, trilobites first appeared 570 to 500 million years ago and died out about 265 million years ago.Paleontologists can use the general age of trilobites to determine the age of other fossils found in the same rock layer.

Relative dating is not a precise measurement, however. Scientists can only say when it first appeared inthe fossil record and compare this information to fossils found in earlier or later layers.

To be more precise, paleontologists use radiometric dating. In this method, scientists measure theamounts of naturally occurring radioactive isotopes (atoms that carry an electrical charge) found in rocks. This tells scientists how old the rock layer is, as well as the age of fossils in that rock layer.

Radiometric dating has drawbacks as well. Most radiometric dating can only be used on igneous rocks,not sedimentary rocks or actual fossils. Fossils are found in sedimentary rock. So paleontologists have touse radiometric dating information on igneous rocks found in layers below and above the fossils in order to determine an age range of the sedimentary rock.

1. How do scientists use relative dating to determine the age of a fossil?

2. What are index fossils?

3. Identify a drawback of using radiometric dating to determine the ageof a fossil.

Name_____Date_____Class _____

Lesson 3: Rate of Change

Understanding Main Ideas

Answer the following questions on the lines below.

1. How do new species form?

_____

_____

2. What are some examples of natural barriers than can separate group members?

_____

3. What evidence in the fossil record supports gradualism?

_____

Building Vocabulary

Write a definition for each of these terms on the lines below.

4. gradualism

_____

_____

5. punctuated equilibrium

_____

_____

Name_____Date_____Class _____

Lesson 3: Rate of Change

If the statement is true, write *true*. If the statement is false, change the underlined word orwords to make the statement true.

1. _____A new species can form when a group of individuals remains completely separated from the rest of its <u>family</u> long enough to evolve different traits that prevent reproduction.

2. _____A natural <u>catastrophe</u> such as a river or volcano, may separate groupmembers.

3. _____The Kaibab squirrel and the Abert's squirrel are members of <u>the same</u>species.

4. _____Scientists have developed <u>three</u> patterns to describe the rate of evolution.

5. _____The fossil record shows patterns of gradualism over <u>short</u> periods of time.

6. _____<u>Evolution</u> explains how variations can lead to changes in a species.

Fill in the blank to complete each statement.

7. _____occurs when some members of a species become cut off.

8. The cow and the dog are separate species, unable to_____with each other.

9. _____is a pattern of new species forming over very long periods of time.

10. _____is a pattern of new species evolving during shortperiods of rapid change.

Name_____Date_____Class _____

Enrich

Lesson 3: Rate of Change

In the fossil record, new species of organisms sometimes appear rapidly in a process known as punctuated equilibrium. Read the passage below. Then use a separate sheet of paper to answer the questions that follow.

Punctuated Equilibrium

Punctuated equilibrium is a process used to explain the evolution of certain species in which rapid change takes place in a short period of time. This change usually occurs as a result of some significantgeological event. The following example describes this process:

1. A population of mice live in a coastal area. This population is stable, with members living, dying, and getting fossilized over time.

2. A rise in the sea level creates an island along the coast. A small group of mice is isolated on the island away from therest of the population on the coast.

3. The isolated population of mice experiences rapid change because of the small population size and the new environment. Because the population is small, any mutations in individual mice influence the evolution of the population. Also, there are no major predators on the new island. Over a short period of time, the mice become larger in size.

4. The fossil record for this time period does not contain many fossils showing this transition from smaller to larger mice.
This is due to the small population size, the rapid pace of change, and the isolatedlocation of the island.

5. The sea level drops again and the island becomes part of the mainland again. The new population oflarge mice comes into contact with the older population of small mice. The large mice now out-competethe small mice for food and shelter, resulting in the extinction of the small mice.

6. The population of large mice now achieves stability, with members living, dying, and getting fossilized over time.

1. What is punctuated equilibrium?

2. In the example above, why do the small mice become extinct?

3. Imagine that you are a scientist studying the mice described in the example above. Describe what you would see in the fossil record forthese mice.

Name_____Date_____Class _____

Chapter 2: Lesson 1: What Causes Climate?

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

1. _____ Temperature is affected by latitude, altitude, distance from large bodies of water, and ocean currents.
2. _____Many mountainous areas have warmer climates than the lower areas around them.
3. _____In general, areas near the poles have warmer climates because the sun's rays hit Earth's surface more directly there.
4. _____The main factors that affect temperature are prevailing winds, the presence of mountains, and seasonal winds.
5. _____ Climate is the average, year-after-year conditions of temperature, precipitation, wind, and clouds in an area.

Fill in the blank to complete each statement.

6. Between the tropical zones and the polar zones are the_____zones.
7. Much of the west coasts of North America, South America, and Europe have _____climates.
8. _____winds are those that usually blow in one direction in a region.
9. Inland regions of North America and Asia have_____climates.
10. _____are sea and land breezes over a large region that change direction with the seasons.

Name_____Date_____Class _____

Lesson 1: What Causes Climate?

Understanding Main Ideas

Answer the following questions in the spaces provided. Use a separate sheet of paper if you need more room.

1. Explain why some places on Earth are warm and others are cold.

_____

_____

2. How do prevailing winds affect the precipitation an area experiences?

_____

_____

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

3. ____leeward
4. ____polar zones
5. ____climate
6. ____windward
7. ____tropical zone
8. ____marine climate
9. ____temperate zones
10. ____monsoon
11. ____continental climate

a. the average year-after-year conditions of temperature, precipitation, winds, and clouds

b. an area near the equator that receives direct sunlight all year round

c. the side of a mountain that faces oncoming wind

d. a climate that is not warmed or cooled by the ocean

e. areas that extend from about 66.5° to 90° north and south latitudes

f. the side of a mountain that does not face oncoming wind

g. sea and land breezes over a large region that change directions with the seasons

h. areas located from about 23.5° to 66.5° north and south latitudes

i. a moderate climate affected by winds off the ocean

Name_____Date_____Class _____

Enrich

Lesson 1: What Causes Climate?

Read the passage. Then use a separate sheet of paper to answer the questions that follow.

Earth's Deserts

Although they all have arid climates, not all deserts are the same. They are classified as trade wind,midlatitude, rain shadow, coastal, monsoon, or polar deserts.

Trade wind deserts occur near the equator. As trade winds blow toward the equator, they heat up anddry out. The result is little or no cloud cover or precipitation and more sunlight heating the ground. Most
of Earth's large deserts are in areas affected by trade winds. The world's largest non-polar desert, theSahara in North Africa, is a trade wind desert.

Midlatitude deserts occur mostly in Earth's temperate zones. These deserts are far from oceans andare sometimes called "cold" deserts, although they may have a wide temperature range. The Sonoran Desert in southwestern North America is a midlatitude desert.

Coastal deserts are usually found on the western edge of continents near the Tropics of Cancer andCapricorn. The Atacama of South America is a coastal desert. In the Atacama, measurable rainfall—one millimeter or more of rain—is rare, occurring only about every 5–20 years.

Monsoon deserts form when warm ocean water evaporates, forms clouds, and is blown over hot, dryland. The result is heavy rainfall. As the air mass moves and drops its moisture, it dries out completely.
Land located father inland receives no rain. The Rajasthan Desert of India is a monsoon desert.

Polar deserts receive less than 250 millimeters of precipitation a year. Instead of sand dunes, snow dunesare sometimes common. Antarctica is an example of a polar desert.

1. Why is Antarctica classified as a desert even though it has snow and ice?

2. Where do most of Earth's large deserts occur?

3. Where are coastal deserts usually found?

4. Compare and contrast two of the desert types described above.

Name_____Date_____Class _____

Lesson 2: Climate Regions

Fill in the blank to complete each statement.

1. The_____climate is the coldest climate region and includes the tundra and ice cap climates.
2. The tropics are areas that have two types of_____climates: tropical wet and tropical wet-and-dry.
3. _____climates include semiarid and arid climates.
4. Daily weather, amount of sunlight, and the pattern of seasons vary according todifferent_____.
5. Temperature falls as altitude increases, so_____regions are colder than the regions that surround them.

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

6. _____Scientists classify daily weather according to factors including temperature, precipitation, and vegetation.
7. _____The main climate regions are tropical rainy, dry, temperate marine, temperate continental, polar, and highlands.
8. _____Temperate continental climates are found only on continents in the Northern Hemisphere.
9. _____Humid subtropical, marine west coast, and Mediterranean are three kinds of rainy climates.
10. _____In the Southern Hemisphere there are no large land areas at the right latitude for polar climates to occur.

Name_____Date_____Class _____

Lesson 2: Climate Regions

Understanding Main Ideas

Answer the following question on a separate sheet of paper.

1. What factors do scientists consider as they classify climates?

Complete the table below by filling in the climate regions.

Climate Region	Precipitation	Temperature
2.	heavy	hot
3.	low	hot or cold
4.	heavy	mild
5.	moderate	warm to cold
6.	low to moderate	cold
7.	varies with altitude	varies with altitude

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term in the left column.

8. _____permafrost

9. _____subarctic

10. _____savanna

11. _____humid subtropical

12. _____desert

13. _____tundra

14. _____rain forest

15. _____steppe

a. arid regions that get less than 25 cm of rain yearly

b. forest in which abundant rain falls year-round

c. climate is wet and warm, but not as hot as tropics

d. climate that lies north of the humid continental climates

e. tropical grassland

f. permanently frozen tundra soil

g. semiarid region, also called a prairie or grassland

h. climate region north of the subarctic

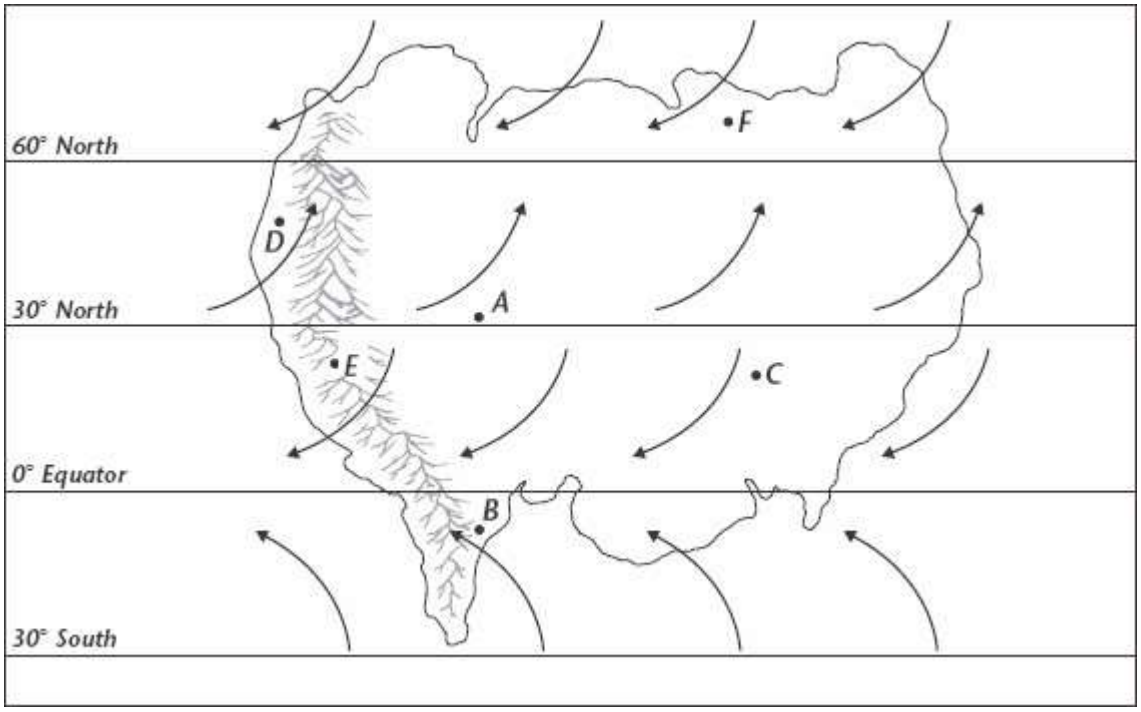
Name_____Date_____Class _____

Enrich

Lesson 2: Climate Regions

The figure below is a map of an imaginary continent on Earth that is surrounded by water. The arrows indicate the direction of the prevailing winds. One large mountain range is also shown. Points A, B, C, D, and F are located at or near sea level; E is high in the mountains. Study the figure, and then use a separate sheet of paper to answer the questions that follow.

Factors That Affect Climate Regions



1. Which location would have a marine west coast climate?_____
2. On the basis of B's location, describe B's climate. Then identify itsclimate region.

   _____
3. Which location is in a large desert? Explain what would cause thislocation to have low annual rainfall.

   ._____
4. Short grasses and low bushes grow in location C. What climateregion is location C? .

   _____
5. Which location would have a highland climate? ._____
6. Where would you expect to find a climate with short, cool summers followed by long, bitterly cold winters.

   _____

Name_____Date_____Class _____

Lesson 3: Changes in Climate

Fill in the blank to complete each statement.

1. The movements of_____over time affected the global patterns of winds and ocean currents, which slowly changed climates.
2. Major volcanic eruptions are one explanation for major_____.
3. Scientists analyze_____found in lake bottoms to learn what type of plants lived there thousands of years ago.
4. The width of_____helps scientists learn about temperatures and precipitation long ago.
5. Changes in the direction of Earth's axis and changes in the angle at which it tilts affect the severity of_____.

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

6. _____During each ice age, huge sheets of ice called aerosols covered large parts of Earth's surface.
7. _____Scientists believe that if plants or animals today need certain conditions to live, then similar plants and animals in the past also required those conditions.
8. _____Earth's climate has not been affected by the angle of Earth's axis and the shape of Earth's elliptical orbit around the sun.
9. _____Scientists have concluded that there have been about five ice ages on Earth during the last two million years, the last ending about 10,000 years ago.
10. _____Changes in climate occur slowly, but the consequences of such changes are great.

Name_____Date_____Class _____

Lesson 3: Changes in Climate

Understanding Main Ideas

Answer the following questions using a separate sheet of paper.

1. What principle do scientists follow when they study ancient climates?

2. List three sources of information scientists use to learn about ancient climates.

3. How does Earth's surface change during an ice age?

4. What are three possible causes of climate change?

Building Vocabulary

Fill in the space to complete each sentence.

5. Solid particles or liquid drops in gas, called_____, can stay in the upper atmosphere for months or years, reflecting away some incoming solar radiation.

6. Dark, cooler regions on the surface of the sun, called_____, have been linked to short-term climate changes.

7. Over millions of years, warm climate periods have alternated with cold climate periods known as _____, or glacial episodes.

Name_____Date_____Class _____

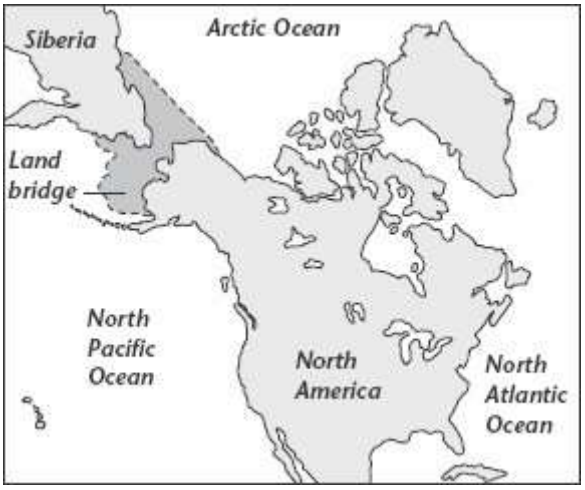
Enrich

Lesson 3: Changes in Climate

Read the passage and study the map. Then use a separate sheet of paper to answer the questions that follow.

The Bering Land Bridge

The map below shows the land bridge that formed during the last ice age between the areas that are now Siberia and Alaska. This ice age occurred between 30,000 and 10.000 years ago. Scientists think that the first people to enter the North American continent crossed this land bridge from Siberia. These people hunted and followed the animals as the animals traveled across the land bridge. Plant and animallife was abundant on the land bridge because the area was not covered with glaciers. Plants common
to tundra regions and subarctic forests covered the land. Animals, such as reindeer, horses, mammoths,bison, and scimitar-toothed cats, as well as birds and fish, provided food sources for these people.



1. At the end of the ice age, about 10,000 years ago, the land bridge disappeared into the sea. Describe how youthink the land bridge had originally formed.

2. Many animal species, such as mammoths and scimitar-toothed cats, became extinct at the end of the last ice age.Explain why this occurred.

3. Scientists have evidence that people who crossed the land bridge migrated to all parts of North and South America. Choose one site in North America to which people might have migrated, and mark its location on the mapabove. Now assume that the climate at this location changed after the ice age to its current climate conditions. Describe how people there might have adapted to these climate changes.

Name_____Date_____Class _____

Lesson 4: Human Activities and Climate Change

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

1. _____Many human activities are increasing the level of the greenhouse effect inthe atmosphere.

2. _____One effect of global warming is drought and desertification.

3. _____Another effect of global warming is changes to ecosystems in the biosphere.

4. _____Being more energy-efficient will help to limit the radiation of heat back tospace as infrared waves.

5. _____Most of the carbon dioxide in the atmosphere was released by humanbeings burning methane.

Fill in the blank to complete each statement.

6. One cause of rising global temperatures is increasing levels of_____.

7. The most abundant greenhouse gas is_____.

8. The_____is necessary to keep Earth's surface warm.

9. Severe droughts cause some lands to become deserts, and this process leads to _____

10. Melting glaciers are causing_____to rise around the world.

Name_____Date_____Class _____

Lesson 4: Human Activities and ClimateChange

Understanding Main Ideas

Answer the following questions. Use a separate sheet of paper.

1. Define the greenhouse effect and identify the four steps involved in the process.
2. Explain why the level of greenhouse gases in the atmosphere is rising.
3. Identify one important effect of the rise in the level of greenhouse gases.
4. Explain what changes to the biosphere, rising sea levels, drought and desertification, regional changes in temperature, and melting glaciers have to do with one another.
5. Identify three human solutions for limiting global warming and climate change.

Building Vocabulary

Fill in the space to complete each statement.

6. A gradual increase in the temperature of Earth's atmosphere is called_____.
7. An energy-rich substance formed from the remains of organisms is a(n)_____.
8. A gas in the atmosphere that traps heat is called a(n)_____.

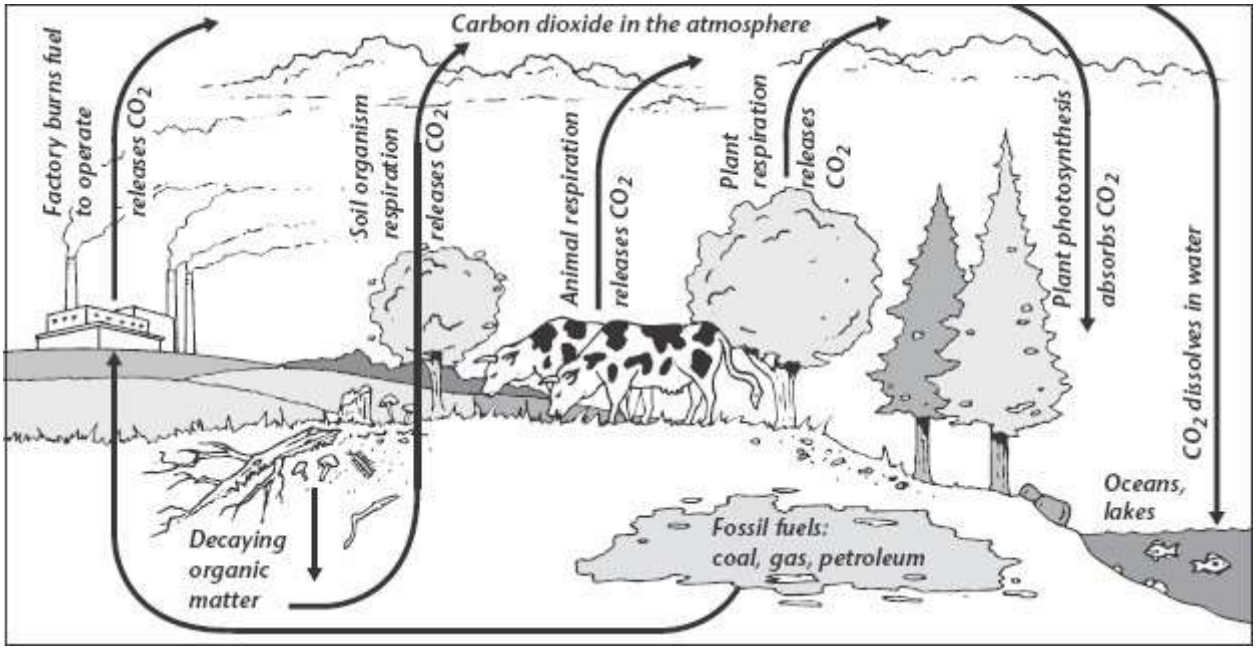
Name_____Date_____Class _____

Enrich

Lesson 4: Human Activities and Climate Change

The figure below shows how carbon is exchanged among plants and animals and how it moves between the air, the ground, and the water. Study the figure and then use a separate sheet of paper to answer the questions that follow.

The Carbon Cycle



1. How does carbon dioxide get into the atmosphere?

2. Where does carbon dioxide in the atmosphere go?

3. Carbon that plants do not use is returned to water or air as carbon dioxide in the process of respiration. Whathappens to the carbon stored in a plant when the plant dies?

4. Millions of years ago, organisms that did not decompose totally were changed into coal, oil, and natural gas.These are now our supply of fossil fuels. This stored carbon is released into the air as carbon dioxide when the fuels are burned. Explain why some scientists believe that this process is causing our climate to change.

5. Using your knowledge of the carbon cycle, describe two possible ways to slow global warming caused by thegreenhouse effect.

Name_____Date_____Class _____

Chapter 3: Lesson 1: Fossil Fuels

Fill in the blank(s) to complete each statement.

1. A fuel is a substance that provides_____.
2. _____is a solid fossil fuel that forms from plant remains.
3. Petroleum is another name for the fossil fuel_____.
4. A factory in which crude oil is heated and separated into fuels and other products is called a_____.

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

5. _____Chemical compounds that contain carbon and hydrogen atoms are called petrochemicals.
6. _____Fossil fuels are the energy-rich substances formed from the remains of long-dead organisms.
7. _____The three major fossil fuels are coal, oil, and petroleum.
8. _____Oil is the most plentiful fossil fuel in the United States.
9. _____Natural gas forms from some of the same organisms as oil.
10. _____Because fossil fuels are formed over hundreds of millions of years, they are considered renewable resources.

Name_____Date_____Class _____

Lesson 1: Fossil Fuels

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. What are the three major fossil fuels?
2. How do fossil fuels form?
3. How is energy produced from fossil fuels?
4. Why are fossil fuels considered nonrenewable?

Building Vocabulary

Write a definition for each of these terms on the lines below.

5. petroleum

_____

_____

6. hydrocarbons

_____

_____

7. refinery

_____

_____

8. petrochemicals

_____

_____

Name_____Date_____Class _____

Enrich

Lesson 1: Fossil Fuels

The tables show the amount of fossil fuels produced and used in the United States from 1957 to 2007. The numbers represent quadrillions of BTUs, British thermal units, used for measuring energy. Calculate the total amount of fossil fuels produced and used each year. Enter your results in the tables. Then answer the questions on a separate sheet of paper.

Fossil Fuel Production and Use

U.S. Fossil Fuel Production (in quadrillions of BTUs)

Year	Coal	Oil	Natural Gas	Total Produced
1957	13.1	15.2	10.6	1.
1967	13.8	18.7	17.9	2.
1977	15.8	17.5	19.6	3.
1987	20.1	17.7	17.1	4.
1997	23.2	13.6	19.5	5.
2007	23.5	10.8	19.8	6.

U.S. Fossil Fuel Use (in quadrillions of BTUs)

Year	Coal	Oil	Natural Gas	Total Produced
1957	10.8	17.9	10.2	7.
1967	11.9	25.3	17.9	8.
1977	13.9	37.1	19.9	9.
1987	18.0	32.9	17.7	10.
1997	21.4	36.3	22.6	11.
2007	22.8	39.8	23.6	12.

13. Use your totals to make a bar graph. Plot years on the horizontal axis and amounts of fossil fuels on the vertical axis. Make two bars for each year—showing total fuel production and total fuel use. Use colors orshading for the bars. Give your graph a title and key.

14. Compare the two bars for every year shown. What pattern do you see? Which type of fossil fuel was mostresponsible for that pattern?

15. What happens when the country produces less fossil fuel than it needs?

Name_____Date_____Class _____

Lesson 2: Renewable Sources of Energy

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

1. _____Sunlight, water, wind, nuclear power, biomass fuels, geothermal energy, and hydrogen are all nonrenewable energy sources.
2. _____The fastest-growing energy source in the world is wind energy.
3. _____In order to harness geothermal energy, cool water is pumped down into deep wells.
4. _____Inside a nuclear power plant, nuclear fission takes place within the heat exchanger.
5. _____The radioactive wastes produced by nuclear fission remain dangerous for dozens of years.

Fill in the blank to complete each statement.

6. Energy from the sun is called_____.
7. _____is electricity produced by flowing water.
8. _____can also be converted into other fuels, such as gasohol, which is formedby adding alcohol to gasoline.
9. The intense heat from Earth's interior that warms the magma is called_____.
10. _____is the splitting of an atom's nucleus into two nuclei.

Name_____Date_____Class _____

Lesson 2: Renewable Sources of Energy

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Some sources of energy are called *alternative sources*. To what sources of energy are they an alternative?

2. Name five alternative sources of energy.

3. Explain how wind and flowing water can be used to produce electricity.

4. Describe how electricity is produced inside a nuclear plant.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

5. ____solar energy	**a.** a fuel made from a mix of alcohol and gasoline
6. ____nuclear fission	**b.** the uranium rods inside a nuclear reactor that produce fission
7. ____hydroelectric power	**c.** a group of fuels made from living things
8. ____gasohol	**d.** intense heat from Earth's interior that warms magma
9. ____reactor vessel	**e.** the splitting of an atom's nucleus into two nuclei
10. ____fuel rods	**f.** energy from the sun
11. ____biomass fuels	**g.** the cadmium rids inside a nuclear reactor that slow the reactions
12. ____geothermal energy	**h.** the part of a nuclear reactor in which nuclear fission occurs
13. ____control rods	**i.** electricity produced by flowing water

Name_____Date_____Class _____

Enrich

Lesson 2: Renewable Sources of Energy

Wind generators are useful only in places where the wind blows steadily at 13 kilometers per hour or more. Could wind generators be used where you live? Try this activity to find out if the wind is strong enough to operate a wind generator.

Measuring Wind Speed (Demonstration)

Materials

sewing needle

30 cm heavyweight

threadtable-tennis

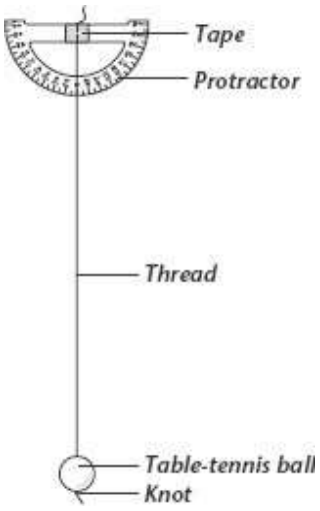
ball

maskin

g tape

protract

or



Procedure

1. Tie a knot in one end of the thread. Carefully use the needle to pull the thread all the way though the table-tennis ball.
2. Tape the other end of the thread to the center mark on a protractor.
3. Choose a windy place outdoors. With your back to the wind, hold the protractor with its straight edge up andparallel to the ground.
4. Prepare a data table to record the date,time, angle of the thread, and wind speed. Put in enough rows to record data twice a day for one week.
5. Read and record the angle where the thread crosses the protractor'scurved edge. Use the table on this page to convert the angle to windspeed.
6. Repeat your measurements twice a day for one week. Calculate theaverage wind speed for the week. Is the wind in your area strong enough to operate a wind generator?

Angle	Wind Speed (km/h)
90°	0
85°	6
80°	8
75°	10
70°	12
65°	13
60°	15
55°	16
50°	18
45°	20
40°	21
35°	23
30°	26
25°	29
20°	33

Name_____Date_____Class _____

Lesson 3: Energy Use and Conservation

Fill in the blank(s) to complete each statement.

1. Only recently have_____become the main energy source in the U.S.
2. In the nineteenth century, with the westward expansion of railroads, _____ gained in popularity as a fuel.
3. One way to preserve our current energy resources is to increase the _____ of our energy use.
4. Another way to preserve those resources is to_____energy whenever possible.

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

5. _____For most of human history, people <u>burned wood</u> for light, heat, and energy.
6. _____In addition, people harnessed the power of renewable resources such as <u>wind and water</u>.
7. _____In the mid-twentieth century, <u>wood and water</u> joined coal as the dominant fuels.
8. _____As fossil fuel supplies decrease, interest has increased in looking for <u>nonrenewable</u> energy sources.
9. _____<u>Insulation</u> is the percentage of energy that is actually used to perform work.
10. _____ <u>Energy conservation</u> means reducing energy use.

Name_____Date_____Class _____

Lesson 3: Energy Use and Conservation

Understanding Main Ideas

Answer the following questions in the spaces provided.

1. Until the nineteenth century, what were the three main sources of energy in the United States?

_____

2. In the last two hundred years, what fuels have people used most?

_____

3. Why are scientists looking for new fuels to replace fossil fuels?

_____

_____

4. What is energy efficiency, and why is increasing it important?

_____

_____

5. Why is a compact fluorescent light bulb more efficient than an incandescent bulb?

_____

_____

6. How can insulation in a building save energy?

_____

_____

Building Vocabulary

Fill in the blank to complete each statement.

7. _____is the percentage of energy used to perform work.

8. A layer of material that traps air is_____.

9. Energy_____means reducing energy use.

Name_____Date_____Class _____

Enrich

Lesson 3: Energy Use and Conservation

For a school project, Arturo Diaz wants to find out how much energy his family's home uses in a month. Their furnace uses oil. Their water heater and stove use natural gas. The table shows the data that Arturo collected for the month. Complete the table. On a separate sheet of paper, answer the questions that follow the table.

One Family's Household Energy Use Data

Energy Source	Meter/Gauge Readings		Difference in Readings
	Sept. 15	Oct. 15	
1. Electricity	76, 854 kWh	77,638 kWh	
2. Natural Gas	14, 786 ft^3	15,073 ft^3	
3. Fuel Oil	full tank (200 gal.)	3/4 tank (150 gal.)	

4. How many BTUs of electricity did the Diaz family use? (1 kWh = 3,413 BTUs)

_____

5. How many BTUs of natural gas did the Diaz family use? (1 ft^3 of gas produces 100 BTUs)

_____

6. How many BTUs of fuel oil did the Diaz family use? (1 gallon of oil produces 144,000 BTUs)

_____

7. What was the Diaz family's total energy use for a month from these three sources?

_____

8. Calculate the percentage of each energy use.

_____

9. Draw and label a circle graph to show the percentage of each energyuse. (*Hint:* Divide the BTUs for each use by the total BTUs. Multiply each percentage by 360° to determine the arc of each wedge.)

Name_____Date_____Class _____

Chapter 4
Lesson 1: Introduction to Environmental Issues

If the statement is true, write *true*. If the statement is false, change the underlined word orwords to make the statement true.

1. _____Because the three types of environmental issues are interconnected, they are <u>easy</u> to resolve.
2. _____Air pollution in Los Angeles is a <u>nonpoint</u> source.
3. _____A(n) <u>environmental resource</u> occurs naturally in the environment and is used by people.
4. _____The <u>condition</u> of Earth's land, water, or air is called pollution.
5. _____Decisions about how to protect Earth's atmosphere are made <u>on a</u> local level.
6. _____Data provided by environmental scientists are <u>part of</u> what decision-makers consider when resolving an environmental issue.

Fill in the blank to complete each statement.

7. When a population grows, the demand for resources_____.
8. Three general categories of environmental issues are related to pollution, resource use, and_____.
9. _____of an environmental proposal are often economic.
10. _____can be grouped in two categories, point source and nonpoint source.

Name_____Date_____Class _____

Lesson 1: Introduction to Environmental Issues

Understanding Main Ideas

Decision–makers use a Costs-and-Benefits table to organize the positives and negatives of a proposal. Use the table to answer the question below. Consider both short-term and long-term costs and benefits.

Costs	Benefits

1. Suppose a town wants to buy a polluted marsh on an abandoned factory's land, clean up the marsh, and use the area as a nature center for the town. What are two costs and two benefits of the town's proposal?

Building Vocabulary

Answer the following questions in the spaces provided.

2. Give three examples of natural resources.

3. Define *environmental science*. Use your own words.

Name_____Date_____Class _____

Enrich

Introduction to Environmental Issues

Cities around the world are looking for ways to control the problem of traffic. Exhaust from cars adds to air pollution. Sounds of engines and horns add to noise pollution. And the stress of sitting in a car stuck in traffic is bad for the health of drivers and passengers. Read the passage below about one attempt to reduce city traffic. Then use a separate sheet of paper to answer the questions that follow the passage.

Congestion Pricing

Several cities, such as London England and Stockholm Sweden, are using congestion pricing to reduce traffic in the city center. Congestion pricing means charging a fee to every motorist who drives beyond a certain point and enters the center of a large city. The idea behind congestion pricing is that people who do not want to pay the fee will take public transportation instead of driving into the city. As a result there will be fewer cars on the roads. In London, city-center traffic was reduced by about 10-15 percent.In Stockholm, it was reduced by 30 percent. Air quality also improved.

If fewer cars are on the roads, then motorists will move faster instead of stopping in traffic. People who favor congestion pricing point out that fewer cars on the road allows emergency services to get where they are needed. Shorter response times for ambulances and fire engines can save lives.

Another expected benefit of congestion pricing is that the fees collected from drivers will help to pay for improvements in public transportation. People who choose not to drive into the city center will benefit from more frequent trains, buses, and subways, and additional routes and newer vehicles to ride in.

Opponents of congestion pricing say that it is an unfair tax, placing too much burden on the poorest people. Some people who cannot afford to pay the fee do not live near a subway or bus route. Theyhave a long and difficult trip to and from work each day. People who can afford to pay the fee get togo to work in the comfort of their own cars.

Some people say the system costs too much to set up. Every road that leads into the city center must have toll booths or devices to monitor traffic. In London, traffic cameras photograph license plates so that the owners of the cars can be charged. Because many cameras were already in place as safety monitors, London did not have to install too much equipment. But a city that does not already have suchcamera systems, the cost of installing the system would consume many years' worth of fees.

1. One issue raised by congestion pricing is people who drive as close to the city center as possible, then change topublic transportation to avoid the congestion fee. How might a city deal with this situation?

2. Should any vehicles be allowed to drive into the city center without paying the congestion fee? Explain youranswer.

3. Do you think congestion pricing is a good way to control traffic? Explain your answer.

Name_____Date_____Class _____

Lesson 2: Introduction to Natural Resources

Write the letter of the correct answer on the line at the left.

1. ____Natural resources include

A fresh water

B television

C ovens

D computers

2. ____Humans depend on natural resources for

A health and welfare

B art and leisure

C survival and development

D growth and maturity

3. ____Globally, fuels are used for

A power and trade

B weapons and travel

C research and development

D cooking and heating

4. ____Ecological footprints are measured in

A square miles

B global hectares

C square meters

D English units

If the statement is true, write *true*. If the statement is false, change the underlined word orwords to make the statement true.

5. _____Resource conservation can make resources last <u>forever</u>.

6. _____A high level of resource use makes a <u>larger</u> ecological footprint.

7. _____Sustainable use means using a resource in ways that maintain the resource at a certain quality for a <u>generation</u>.

8. _____Some renewable resources are renewable only if they are replaced <u>a little more slowly than</u> they are used.

9. _____Oil and coal were formed over <u>hundreds</u> ofyears.

10. _____<u>Not al</u>l resources are available equally in all parts of the world.

Name_____Date_____Class _____

Lesson 2: Introduction to Natural Resources

Understanding Main Ideas

Answer the following questions in the spaces provided.

1. Explain how renewable resources and non-renewable resources are different. Give two examples of each.

_____

_____

_____

2. What is similar and different about how natural resources are used in different parts of the world?

_____

_____

_____

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

3. ____sustainable use

4. ____natural resource

5. ____ecological footprint

6. ____nonrenewable resource

7. ____conservation

8. ____renewable resource

A. wind

B. allows you to maintain a resource at a certain quality over a certain period of time

C. amount of land and water individuals use

D. managing resource use so that resources last longer

E. occurs naturally in the environment and is used by people

F. coal

Name_____Date_____Class _____

Enrich

Lesson 2: Introduction to Natural Resources

Read the passage below. Then use a separate sheet of paper to answer the questions that follow the passage.

Keeping Water Clean

Clean water is an essential natural resource. Prior to 1987, the Clean Water Act was the primary government tool for controlling water pollution from point sources of pollution. The government definesa point source as “any discernable, confined and discrete source of pollution.” Point sources include factories and waste-treatment facilities. Businesses like these are monitored by the government. If a business is found to be releasing more than an acceptable level of pollution, the company must pay fines. In some cases, company executives have to serve jail sentences.

As such point sources of pollution began to be controlled, water quality improved. But it became clear that factories, waste-treatment facilities, and other industries were not the only sources of waterpollution. In 1987, Congress recognized the need to control additional kinds of pollution. More rules were added to the Clean Water Act for the purpose of controlling nonpoint sources of pollution.

Nonpoint sources of pollution cannot be traced to a specific source. They are detected in bodies of water, but it is impossible to tell exactly how they got there. Pollutants in storm water runoff are considered nonpoint sources. Household activities that contribute to pollution include dumping usedmotor oil or pet waste into a storm drain. Fertilizers and pesticides used on lawns become nonpoint sources of pollution when storm runoff carries these chemicals into bodies of water.

Since nonpoint sources cannot be identified, the government has to rely on voluntary cooperationby citizens, rather than the fines that industries face. The government educates citizens about the
importance of reducing pollution. Guidelines for use of fertilizers and pesticides have been developed.Many communities have passed laws prohibiting the release of pet waste and oil into the environment.Efforts by individuals have contributed significantly to the improvement of water quality.

1. If you dump the oil you removed from your lawnmower down a storm drain, the oil entered the water from aspecific point. Why is this not considered point source pollution?

2. Why is 1987 such an important year in pollution control?

3. The pollution from an average household is much less than that released by a factory. Why is it important tocontrol the pollution released by an individual household?

Name_____Date_____Class _____

Lesson 3: Conserving Land and Soil

If the statement is true, write *true*. If the statement is false, change the underlined wordor words to make the statement true.

1. _____Less than a quarter of Earth's surface is dry, ice-free land.
2. _____Because it can take one year to form just a few centimeters of new soil, it is important to protect Earth's soil.
3. _____If a farmer plants a field with different crops each year, the soil becomes less fertile, a situation called nutrient depletion.
4. _____Without soil, most life on land could not exist.

Fill in the blank to complete each statement.

5. The structure of fertile soil contains layers including litter, topsoil,_____, and bedrock.
6. Strip mining exposes soil and causes_____.
7. When soil becomes depleted, farmers usually apply fertilizers, which include _____that help crops grow better.
8. One cause of desertification is_____, a period when less rain than normal falls in an area.
9. _____is the layer of soil where the most water and nutrients are absorbed by plant roots.
10. The process of restoring an area of land to a more productive state is called_____.

Name_____Date_____Class _____

Lesson 3: Conserving Land and Soil

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Explain three ways that people use and change land.
2. Describe the structure of fertile soil.
3. Why is soil so important to human beings?
4. How do erosion, nutrient depletion, and desertification damage or destroy soil?

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

5. ____litter
6. ____topsoil
7. ____subsoil
8. ____bedrock
9. ____erosion
10. ____nutrient depletion
11. ____fertilizer
12. ____desertification
13. ____drought
14. ____land reclamation

a. material that includes nutrients that help crops grow better

b. layer of soil in which water and nutrients are absorbed by plant roots

c. a period when less rain than normal falls in an area

d. a process in which soil becomes less fertile

e. the rock that makes up Earth's crust

f. top layer of soil containing dead leaves and grass

g. restoring an area of land to a more productive state

h. layer of soil above bedrock

i. the advance of desert-like conditions into areas that were fertile

j. the process by which water, wind, or ice moves soil or particles of rocks

Name_____Date_____Class _____

Enrich

Conserving Land and Soil

The Copper Basin is a large area of land in southeastern Tennessee. The area gets its name from the copper mining that took place there about 150 years ago. The Copper Basin was once a deciduous forest ecosystem. Now, the area consists mostly of bare hills with deep gullies caused by erosion. What happened in the Copper Basin? Read the following passage. Then answer the questions that follow on a separate sheet of paper.

The Copper Basin

When people discovered copper ore in the Copper Basin, mining companies began to dig up and process this ore. Copper ore contains many unwanted materials mixed with the copper metal. To remove the unwanted materials, the mining companies would smelt the ore, or heat it in a furnace. The smelters looked like huge, open fire pits. To keep the smelters burning, all the surrounding trees were cut down and used as fuel.

The burning ore released sulfur dioxide gas. In the air, the sulfur dioxide reacted with water vapor to form sulfuric acid. The acid fell back to Earth in rain and soaked into the soil. The acid in the soil killedplants as they began to grow where the trees had been cut down.

Animals that depended on the trees and other forest plants for food and shelter left the area. And withno plant roots left to hold down the soil, runoff from rain eroded the land. In just a few years, the entireforest ecosystem in the Copper Basin was destroyed.

Beginning in the 1930s, government agencies tried to replant part of the Copper Basin, but the soil was still too acidic. Most of the plants died. Then, nearly 50 years later, land reclamation scientists tried again, using new planting methods. They were more successful, and plants began to repopulate parts of the Copper Basin. Their roots helped prevent further erosion. Dead leaves decomposed and enriched the soil. Small animals began returning to the area. But progress is slow. Scientists estimate that it will take atleast 100 more years for a true forest ecosystem to return to the Copper Basin.

1. What type of ecosystem existed in the Copper Basin area before mining began?

2. Once mining began, why were there no plants roots to hold soil in place?

3. How did the soil become contaminated with sulfuric acid?

4. What does “land reclamation” mean?

5. What changes might occur in the area as new plants continue to grow?

6. Why do you think it will take so long for the original ecosystem to rebuild?

Name_____Date_____Class _____

Lesson 4: Waste Disposal and Recycling

Fill in the blank to complete each statement.

1. _____solid waste includes empty packaging, paper, food scraps, agricultural and industrial waste, and construction debris.
2. The burning of solid waste is called_____.
3. One safe way to handle solid waste is to bury it in_____.
4. _____is reclaiming and reusing raw materials to create new products.

If the statement is true, write *true*. If the statement is false, change the underlined wordor words make the statement true.

5. _____Materials that can be broken down and recycled by bacteria and other decomposers are biodegradable.
6. _____ Recycling conserves resources and saves energy.
7. _____ Solid waste is any material that can be harmful to human health or to the environment.
8. _____When rainwater filters down through a dump and dissolves chemicals in the waste, the polluted result is called run-off.
9. _____Most recycling focuses on four major categories of products: metal, glass, paper, and rubber.
10. _____A person can be exposed to hazardous wastes by breathing, eating, drinking, or touching them.

Name_____Date_____Class _____

Lesson 4: Waste Disposal and Recycling

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. What are three methods for the disposal of solid waste?
2. What are three advantages and three disadvantages of incinerators?
3. What is leachate and what major problem does it cause?
4. What are the four major categories of materials that can be recycled?
5. How can exposure to hazardous wastes affect human health?
6. Identify four methods for disposing of hazardous wastes.

Building Vocabulary

Write a definition for each of these terms on the lines below.

7. biodegradable

_____

_____

8. pollutant

_____

_____

9. sanitary landfill

_____

_____

10. municipal solid waste

_____

_____

Name_____Date_____Class _____

Enrich

Lesson 4: Waste Disposal and Recycling

The table below shows how the types of wastes discarded by households in the United States changed between 1960 and 2000. The table shows the amounts as percents of the total wastes discarded. These percents include all materials discarded, whether they were recycled, incinerated, or sent to a landfill. On a separate sheet of paper, use the data to answer the questions that follow the table.

How Wastes Changed

Household Discards from 1960 to 2000

Types of Wastes	Percent of Total Wastes				
	1960	1970	1980	1990	2000
Paper and Cardboard	34.0	36.6	36.4	38.6	37.4
Glass	7.6	10.5	10.0	6.4	5.5
Metals	12.3	11.4	10.2	8.1	7.8
Plastics	0.4	2.4	4.5	8.3	10.7
Food Waste	13.8	10.6	8.6	10.1	11.2
Yard Waste	22.7	19.2	18.1	17.1	12.0
Other Wastes	9.2	9.3	12.2	11.4	15.4

1. Use the data in the table to make a line graph on a sheet of graph paper. Plot the percentages on the verticalaxis. Plot the years on the horizontal axis. Draw a separate line for each type of waste. Use a different color for each line. Include a key to identify the color-coding you used.

2. Which types of wastes increased as a percentage from 1960 to 2000?

3. Which types of wastes decreased as a percentage during that period?

4. Which type of waste increased the most between 1960 and 2000? Is this change related to other changes inthe data? Explain your answer.

5. How might you expect the data for 2000 to be different if it includedonly the materials sent to landfills? Explain your answer.

Name_____Date_____Class _____

Lesson 5: Air Pollution and Solutions

If the statement is true, write *true*. If the statement is false, change the underlined wordor words make the statement true.

1. _____A large percentage of emissions resulting in air pollution today comes from motor vehicles.
2. _____Radon is a thick, brownish haze formed when certain gases in the air react with sunlight.
3. _____In a(n) ozone layer, a layer of warm air prevents rising air from escaping and traps pollutants near Earth's surface.
4. _____The key to reducing air pollution is to control emissions.
5. _____Carbon monoxide damages plants, waterways, and metals and stones.
6. _____CFCs once used in many household products contributed to the creation of a(n) ozone hole.

Fill in the blank to complete each statement.

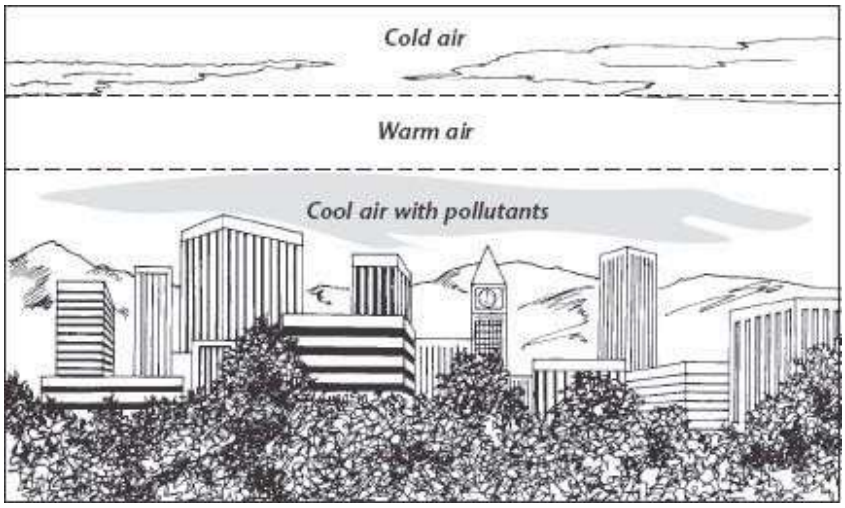
7. _____are pollutants released into the air.
8. Some substances that cause_____air pollution, such as dust and pethair, bother only those people who are sensitive to them.
9. The_____protects people from the effects of too much ultraviolet radiation.
10. Individuals can reduce air pollution by using electricity and motor vehicles_____.

Name_____Date_____Class _____

Lesson 5: Air Pollution and Solutions

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.



1. What condition is shown in the figure above? Why is this condition dangerous to people?
2. How is photochemical smog formed?
3. How is acid rain formed?
4. What are two effects of acid rain?
5. Why is carbon monoxide such a dangerous form of indoor air pollution?
6. How does walking instead of driving a car help reduce air pollution?

Building Vocabulary

On a separate sheet of paper, write a definition for each of these terms.

7. emissions
8. photochemical smog
9. acid rain
10. radon

Name_____Date_____Class _____

Enrich

Lesson 5: Air Pollution and Solutions

Ozone is a gas that can be found in both the upper layer of Earth's atmosphere as well as at ground level. Read the passage and study the table about ozone at ground level. Then use a separate sheet of paper to answer the questions that follow the table.

Ozone

At ground level, ozone is formed from pollutants released by motor vehicles. It is toxic and is a major component of smog. Ozone can increase a person's susceptibility to lung infections and damage the body's defenses against infection. The following scale, the Air Quality Index (AQI), was created by the Environmental Protection Agency (EPA) in order to report ground levels of ozone and other air pollutants.Each day, local air quality is rated according to the scale and is reported in local newspapers or on local news and weather reports.

Index Values	Descriptions	Cautionary Statements for Ozone
0 to 50	Good	None
51 to 100	Moderate	Unusually sensitive people should consider limiting prolonged outdoor exertion.
101 to 150	Unhealthy for Sensitive Groups	Active children and adults, and people with respiratory diseases, such as asthma, should limit prolonged outdoor exertion.
151 to 200	Unhealthy	Active children and adults, and people with respiratory diseases, such as asthma, should avoid prolonged outdoor exertion. Everyone else, especially children, should limit prolonged outdoor exertion.
201 to 300	Very Unhealthy	Active children and adults, and people with respiratory diseases, such as asthma, should avoid all outdoor exertion. Everyone else, especially children, should limit outdoor exertion.

1. How is ozone harmful to humans?

2. What does it mean if the AQI value for a particular day is 125?

3. Suppose the AQI value for a particular day is 167. What precautions should a person with asthma take on thisday?

4. Suppose you are an active adult with no sensitivities or respiratory disease. At what AQI value would you want tolimit prolonged outdoor exertion?

Name_____Date_____Class _____

Lesson 6: Water Pollution and Solutions

Write the letter of the correct answer on the line at the left.

1. ___About 97% of the water on Earth is
A fresh water
B groundwater
C salt water
D ice

2. ___Chemicals that kill crop-destroying organisms are called
A sediments
B fertilizers
C acid rain
D pesticides

3.____The water and human wastes that are washed down sinks, showers, and toilets are called
A the water cycle
B sewage
C thermal pollution
D point pollution sources

4. ___Water that causes erosion picks up
A sediments
B sewage
C pollutants
D algae

If the statement is true, write *true*. If the statement is false, change the underlined word orwords to make the statement true.

5. _____Most water pollution is the result of <u>natural processes</u>.

6. _____<u>Industry</u> washes agricultural wastes, including animal wastes, fertilizers, and pesticides, into ponds, causing algae to grow.

7. _____Wastes produced by agriculture, households, industry, mining, and other human activities can end up in <u>water</u>.

8. _____<u>Fresh liquid water</u> is stored in soil and rock beneath Earth's surface.

9. _____<u>Keeping water clean</u> requires effective clean-up of oil and gasoline spills, proper sewage treatment, and reduction of pollutants.

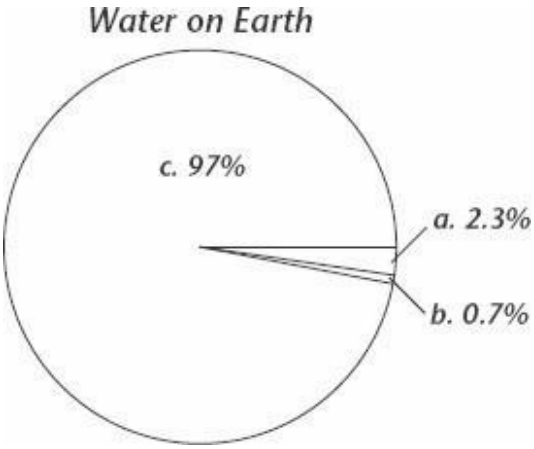
10. _____Most communities treat <u>groundwater</u> before returning it to the environment.

Name_____Date_____Class _____

Lesson 6: Water Pollution and Solutions

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.



1. Which section of the circle graph above represents Earth's salt water? Which section represents ice? Which section represents usable fresh water?
2. How does the water cycle purify Earth's water?
3. What is sewage? Why is it important to treat sewage?
4. How can farm chemicals pollute water? Why is it hard to keep these chemicals from getting into nearby water?
5. What are the keys to keeping water clean?

Building Vocabulary

Write the correct term to complete each sentence below.

6. Water that is stored in layers of soil and rock beneath Earth's surface is called_____.
7. The water and human wastes that are washed down sinks, toilets, and showers are called_____.
8. Chemicals that kill crop-destroying organisms are known as_____.
9. Water that causes erosion picks up_____, or particles of rock and sand.

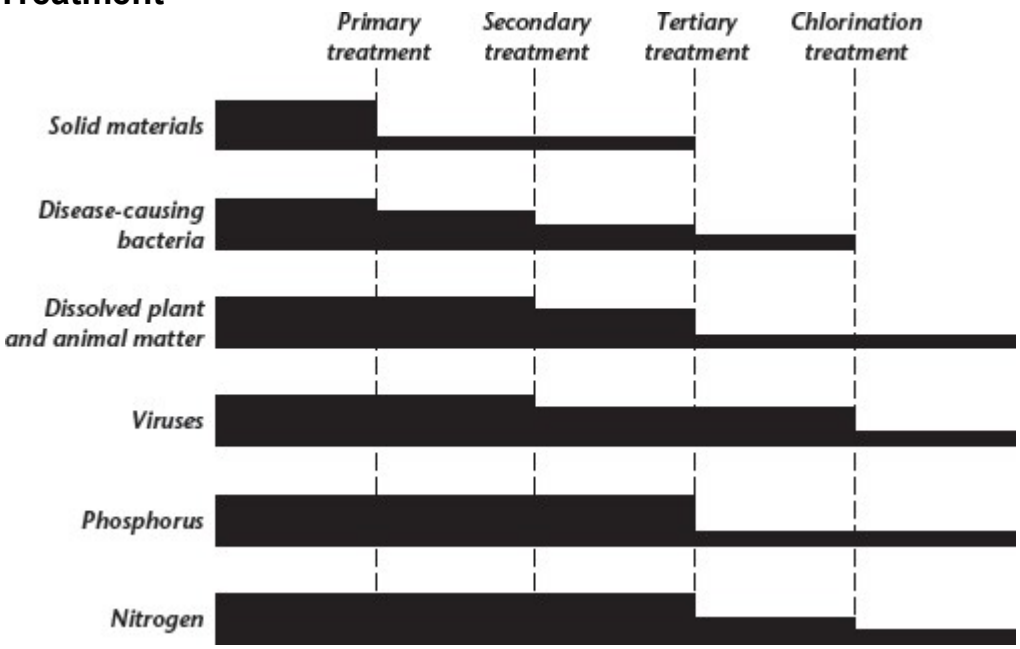
Name_____Date_____Class _____

Enrich

Lesson 6: Water Pollution and Solutions

In addition to primary and secondary treatment, many sewage plants use tertiary treatment to clean wastewater. (*Tertiary* means "third.") The chart below shows which materials are removed in each treatment step. The thickness of the black bar shows how much of each substance remains in the water. Use the chart to answer the following questions on a separate piece of paper.

Sewage Treatment



1. Which materials are mostly removed by primary treatment?_____
2. Which materials are partly removed by secondary treatment? _____
3. Which materials does tertiary treatment help remove? _____
4. If a sewage plant did not use tertiary treatment, which material(s) would not be removed at all?

   _____
5. Which materials are completely removed before the treated water is released into the environment afterchlorination treatment? _____
6. Phosphorus and nitrogen are nutrients that help algae and plants grow. Why is it important to reduce thesematerials before treated water is released? _____

Name_____Date_____Class _____

PART 2: Lesson 1: Scientific Measurement

Fill in the blank to complete each statement.

1. Density is the measure of how much_____is contained in a given volume.
2. A good technique for finding the volume of an irregular solid is _____.
3. There are 1,000 meters in a_____.
4. Measurements for time and_____are the only measurements that do not strictly follow the metric system.
5. Scientists use_____because it enables them to share and compare data and communicate results of investigations.

If the statement is true, write *true.* If the statement is false, change the underlinedword or words to make the statement true.

6. _____Because it is affected by gravity, an object's mass would be less on the moon,where there is less gravity.
7. _____The basic SI unit for the volume of a rectangular solid is the liter.
8. _____Density determines whether an object will float or sink in water.
9. _____The best unit for measuring the length of a pencil is the nanometer.
10. _____The basic unit for measuring mass is the kilogram.

Name_____Date_____Class _____

Lesson 1: Scientific Measurement

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Why do scientists use SI as a standard system of measurement?

2. Why do scientists use SI as a standard system of measurement?

3. Give the basic SI units for length, mass, weight, volume, density, time, and temperature

4. ____mass	**a.** a standard measurement system based on the number 10
5. ____density	**b.** the amount of space taken up by an object
6. ____metric system	**c.** the measure of the amount of matter in an object
7. ____weight	**d.** a version of the metric system used by modern scientists
8. ____meniscus	**e.** the measure of how much mass is contained in a given volume
9. ____volume	**f.** the curve of the liquid used for measuring volume
10. ____International Systemof Units (SI)	**g.** the measure of the force of gravity acting on an object

Name_____Date_____Class _____

Enrich

Lesson 1: Scientific Measurement

Big Cypress National Preserve is the most biologically diverse area in the Florida Everglades. Located about 72 kilometers west of Miami, Big Cypress is home to a magnificent variety of flora and fauna, some of which are endangered. The table below shows the heights of flora and mass of fauna found in Big Cypress. Study the table below. Then answer the questions that follow on a separate sheet of paper.

Flora and Fauna in Big Cypress National Preserve

FLORA	
	Height
Red Mangrove	508 cm
Orange Fringed Orchid	91.5 cm
Bald Cypress	0.04572 km
Sabal Palm	12.192 m
FAUNA	
	Mass
Panther	65,000,000 mg
Black Bear	158 kg
Manatee	272,000 g
Alligator	2,900,000 cg

1. Convert the heights of the flora into the same unit. Then list the flora from greatest to least height.

2. Convert the masses of the fauna into the same unit. Then list the fauna from greatest to least mass.

3. Based on the unconverted measurements, what conclusion can you draw about choosing an appropriate SI unit ofmeasure?

Name_____Date_____Class _____

Lesson 2: Mathematics and Scientific Thinking

Write the letter of the correct answer on the line at the left.

1. ___A student on the archery team gets all her arrows in the same spot on the target. They are all outside the bull's eye. Which best describes her results?

A both accurate and precise
B precise but not accurate
C accurate but not precise
D neither precise nor accurate

2._____A student added the measurements 36.67 g and 4.1 g. Which of the following expresses the sum with the correct number of significant figures?

A 40.7 g
B 40.77 g
C 40.8 g
D 41 g

3._____Which of the following shows the mean with the correct number of significant figures for the numbers 15.6, 14.1, 7.7, 12.9, 12.9?

A 12
B 12.6
C 12.64
D 12.7

4. ___A student calculated the density of tin to be 7.20 g/mL. The actual density of tin is 7.29 g/mL. Which of the following is his percent error?

A 0.01 percent
B 0.09 percent
C 1.23 percent
D 1.25 percent

If the statement is true, write *true*. If the statement is false, change the underlinedword or words to make the statement true.

5. _____ An estimate is an approximation of a number based on reasonable assumptions.

6. _____ Accuracy refers to how close a group of measurements are to each other.

7. _____ The mean is the middle number in an ordered set of data.

8. _____ The median appears most often in a list of numbers.

9. _____ To find percent error, you subtract the true value from the experimental value anddivide by the true value.

10. _____ The anomalous data in a measurement include all digits measured exactly, andone estimated digit.

Name_____Date_____Class _____

Lesson 2: Mathematics and Scientific Thinking

Understanding Main Ideas

Answer the following questions in the spaces provided.

1. When are estimates useful?

_____

2. What is the difference between accuracy and precision?

_____

Calculate the mean, median, mode, and range for the following data set: 14.9, 13.9,13.9,12.8, 11.7.

3. mean =_____

4. median = _____

5. mode =_____

6. range = _____

Building Vocabulary

Fill in the blank to complete the statement.

7. _____communicate how precise measurements are.

8. Sources of error may produce_____that do not fit the data set.

9. The difference between the known value and its measured value is called the_____.

10. Approximations based on reasonable assumptions are called_____.

Name_____Date_____Class _____

Enrich

Lesson 2: Mathematics and Scientific Thinking

Two students measured the mass of the same object five times. The table shows their measurements. Use the measurements to answer the questions that follow on a separate sheet of paper. Express your answers using the correct number of significant figures.

Student Measurements Investigation	
Joel	Carrie
16.4 g	17.0 g
15.8 g	16.9 g
16.3 g	16.9 g
14.9 g	16.7 g
15.8 g	17.1 g

1. Calculate the following for Joel's data: mean, median, mode, range.

2. Calculate the following for Carrie's data: mean, median, mode,range.

3. Whose data is more precise, Joel's or Carrie's?

4. The true value was found to be 16.9 g. Whose data is more accurate, Joel's or Carrie's?

5. Use the mean from each student's measurements to find thestudent's percent error.

Name_____Date_____Class _____

Lesson 3: Using Graphs in Science

If the statement is true, write *true.* If the statement is false, change the underlinedword or words to make the statement true.

1. _____ Bar graphs can be used to represent categorical data.
2. _____ When a graph has no clear trend, it means the variables are related.
3. _____ Scientists control changes in the independent variable.
4. _____ Data points do not fall in a straight line on a(n) nonlinear graph.
5. _____ When scientists use graphs to identify trends, they are making a forecast about what will happen in the future.

Fill in the blank to complete each statement.

6. The_____variable is the variable that responds to changes.
7. A(n)_____is a visual representation, or a picture, of data.
8. Scientists study graphs to help them identify _ _____ in the data.
9. A line graph in which the data points yield a straight line is a(n) _____ graph.
10. A(n)_____is a data point that is clearly not part of a graph's trend.

Name_____Date_____Class _____

Lesson 3: Using Graphs in Science

Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. Give an example of how a scientist might use a graph of the relationship between population growth andtime to identify a trend.
2. Give an example of how a scientist might use a graph of the relationship between population growth andtime to make a prediction.
3. Give an example of how a scientist might use a graph of the relationship between population growth andtime to recognize anomalous data.

Building Vocabulary

Write the definitions to the following words in the space provided.

4. graph

_____

5. linear graph

_____

6. nonlinear graph

_____

7. outlier

_____

Name_____Date_____Class _____

Enrich

Lesson 3: Using Graphs in Science

Many ecologists study variables that affect the growth of plants or animals. These scientists take particular interest in plants and animals that are threatened or endangered. Read the passage below and study the data table. Then answer the questions that follow on a separate sheet of paper.

The Longleaf Pine

The longleaf pine is native to the southeastern united states. At one time, vast forests of longleaf pine, rich in biodiversity, stretched all along the gulf coast and southeastern atlantic coast, from texas to virginia. Because the tree was highly prized for timber, overcutting resulted in extreme deforestation. Today, many conservationists are working to restore the longleaf pine. Part of this work involves studyinghow the tree grows. Longleaf pines can live to be almost 500 years old, which makes study difficult. The data table shows the growth in the height of the trunk in a longleaf pine, from the time that it was 8 to 16 years old.

Growth of Longleaf Pine, Years 8–16	
Year	**Height**
8	1 m
9	1.25 m
10	1.5 m
11	1.75 m
12	2 m
13	4 m
14	6 m
15	8 m
16	10 m

1. Graph the growth of the longleaf pine.

2. What are the independent and dependent variables?

3. What trend do you notice about the growth?

4. What prediction can you make about the growth?

Name_____Date_____Class _____

Lesson 4: Models and Systems

Write the letter of the correct answer on the line at the left.

1. ___Scientists test their ideas about things they **cannot** observe directly by building

A models

B theories

C systems

D evidence

2. ___Input, output, and process are parts of a(n)

A system

B assumption

C model

D hypothesis

3.____Models can help scientists understand a system's

A assumptions

B investigations

C processes

D theories

4. ___Scientists may use a computer to keep track of the variables in a complex

A model

B program

C feedback

D system

If the statement is true, write *true.* If the statement is false, change the underlinedword or words to make the statement true.

5. _____ A(n) simple system is difficult to model.

6. _____ The mercury cycle, water cycle, and rock cycle are all models.

7. _____ Your heart pumping faster when you exercise is an example of input.

8. _____ Scientists may make assumptions to simplify a model.

9. _____ The output of a toaster is electricity.

10. _____ All models are physical objects.

Name_____Date_____Class _____

Lesson 4: Models and Systems

Understanding Main Ideas

If the statement is true, write *true*. If the statement is false, change the underlined word or words to make the statement true.

1. _____ Scientists build theories to test their ideas about things that they cannot observe directly.

2. _____ Scientists test their data by comparing the input and output of their models to the input and output of the system in the natural world.

3. _____ Models allow scientists to predict stability in a system as a result of feedback or input changes.

Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

4. ___process

5. ___output

6. ___feedback

7. ___model

8. ___input

9. ___system

a. action or series of actions that happen in a system

b. material or energy that goes into a system

c. representation of an object or process

d. changes a system in some way

e. material or energy that comes out of a system

f. group of parts that work together to carry out a function

Name_____Date_____Class _____

Enrich

Lesson 4: Models and Systems

A hurricane is a complex weather system and can be very challenging to model. Read the passage below about hurricane models and forecasting. Then use a separate sheet of paper to answer the questions that follow.

Forecasting Hurricanes

No single model can be used to forecast hurricanes in all the different situations that arise in the atmosphere. The national hurricane Center uses several different computer models. Each model has itsown strengths and weaknesses.

Before making a forecast, hurricane specialists look at all the models' results. Drawing on their extensive science education and their experience in tropical forecasting, they determine which model is performingthe best under current conditions. Only then can they tell where a hurricane is likely to make landfall andhow strong its wind force will be.

Tracking a hurricane and predicting its intensity are easiest right before the hurricane makes landfall butis then too late to evacuate people. Therefore, 120 hours before a hurricane is likely to hit, hurricane forecasters start estimating how the hurricane will move and how intense it will be. An early warning allows people in coastal areas time to move to safety before tropical storm-force winds arrive.

Emergency managers often take extra precautions. They plan for a hurricane one category stronger than is forecast. They prepare to take action in case a hurricane speeds up or shifts course.

1. Why are hurricanes difficult to forecast?

2. Why do hurricane forecasters start estimating how a hurricane will track 120 hours before landfall rather than rightbefore it hits?

3. Why do you think emergency managers often take extra precautions?

Name_____Date_____Class _____

Lesson 5: Safety in the Science Laboratory

Understanding Main Ideas

Answer the following questions in the spaces provided.

1. Name two reasons for good preparation before an investigation.

_____

_____

2. Name one safety symbol and tell what it means.

_____

3. Describe how to properly care for animals during investigations.

_____

_____

Building Vocabulary

Fill in the blank to complete each statement.

4. A(n)_____is used to put out fires.

5. A(n)_____symbol is used when you need to protect your clothes.

6. A(n)_____symbol is used when you need to protect your hands from chemicals.

7. A(n)_____symbol is used when you need to protect your eyes from glass breakage.

8. Wear sunglasses and a hat when you do an investigation in the _____.

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Lesson 5: Safety in the Science Laboratory

Write the letter of the correct answer on the line at the left.

1. ___Which safety symbol would appear for an investigation requiring a special tool for separating pollen from a plant?

A animal safety

B corrosive chemical

C heat-resistant gloves

D sharp object

2. ___What is the first safety step you should take before an investigation?

A Clean and organize your work area.

B Make sure you know its safety symbols.

C Put on an apron and goggles.

D Wash your hands.

3. ___What are the first two steps you should follow in case of a fire?

A activate the fire alarm, then leave the building.

B activate the fire alarm, then put out the fire.

C alert your teacher, then follow directions quickly.

D Put out the fire, then call 911.

4. ___Which of the following safety procedures should you always follow in the field?

A Wear goggles.

B Wear sandals.

C Work with a partner.

D Keep a field notebook.

If the statement is true, write *true*. If the statement is false, change the underlinedword or words to make the statement true.

5. _____ The field is any area outside the science laboratory.

6. _____ Wear heat-resistant gloves when working with chemicals.

7. _____ Wear an apron to protect yourself and your clothes from chemicals.

8. _____ Wear plastic gloves to protect your hands from hot beakers.

9. _____ The disposal symbol always appears on investigations that use hot plates.

10. _____ A fire blanket is used to smother flames.

Name Date Class

Enrich

Lesson 5: Safety in the Science Laboratory

You have been asked to review several investigations for safety. Your job is to read the materials lists for the investigations and decide which safety precautions need to be followed. Fill in the table below with the correct safety symbol information. Then answer the questions that follow in the spaces provided.

Investigation	Materials Used	Safety Symbols Needed
A. Ability of different soils to hold water	Water, glass beakers, filter paper, potting soil, sand, timer	1.
B. Preference of pill bugs for dry or moist areas	Pill bugs, paper towels, water	2.
C. Acids and bases	3 unknown solutions, blue litmus paper, red litmus paper	3.
D. Bouncing a ball from different heights	Tennis ball, meter stick, masking tape, calculator	4.
E. Chemical reaction	Glass beaker, baking soda, vinegar, spoon	5.
F. Flame test	Bunsen burner, forceps, chemical element test strips	6.

7. Describe three safety steps you would recommend that students takeafter they finish Investigation C.

_____

_____

8. Describe two safety steps you would recommend for the animalsused in Investigation B.

_____

_____